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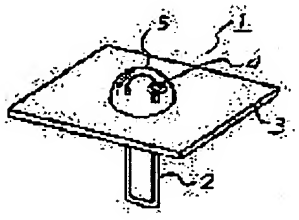
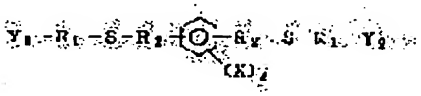
(71)Applicant : MITSUBISHI CHEM CORP
(72)Inventor : HAYAKAWA SEIICHIRO
YOSHINO TORU

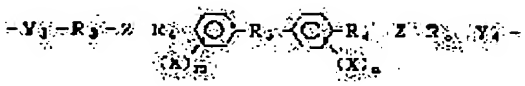
(54) RESIN-ENCAPSULATED HIGH-BRIGHTNESS LIGHT EMITTING DIODE AND ITS MANUFACTURING METHOD

(57)Abstract:
PROBLEM TO BE SOLVED: To achieve high brightness and to improve heat resistance, moisture resistance, and durability by encapsulating a light emitting part with transparent resin with a high refraction made of polymer in at least one type of structure unit which is selected by a specific expression.
SOLUTION: Transparent resin 5 consists of resin having a refractive index of 1.55 or higher made of a polymer in at least one type of structure unit selected from expressions I and II. In a light emitting diode 1, at least a light emitting part 4 is encapsulated with the transparent resin 5, where X represents a halogen atom excluding fluorine and l, m, and n are integers (0 or 1-4) in the expressions I and II. Y1, Y2, Y3, and Y4 are connection groups and may be equal or different. Also, R1, R2, and R4 are alkylene and aralkylene groups which may contains O or S with 0 or 1-10 carbons. Z is either O or S and R3 is alkylene and aralkylene groups which may be container O or S with 1-10 carbons.





I



II

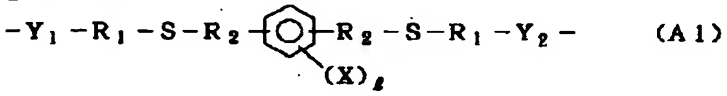
LEGAL STATUS
[Date of request for examination] 16.10.2001
[Date of sending the examiner's decision

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

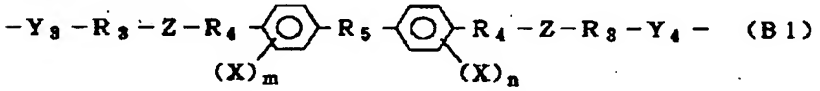
CLAIMS

[Claim(s)]
[Claim 1] Light emitting diode to which the closure of the light-emitting part was carried out for the refractive index which consists of a polymer of at least one sort of structural units chosen from the following general formula (A1) and a general formula (B1) at least with 1.55 or more transparence resin.
[Formula 1]



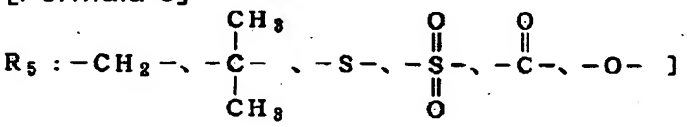
(A1)

Xin [type: -- the halogen atom l:0 except a fluorine or the integer Y1 of 1-4, and Y2 : By the joint radical, even if the same, you may differ.
R1, R2 : The alkylene group, aralkylene group which may contain O or S of 0 or carbon numbers 1-10.]
[Formula 2]

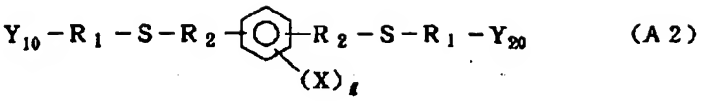


(B1)

Xin [type: -- integer Z:O of the halogen atom m except a fluorine, n:0, or 1-4 or SY3, and Y4 : By the joint radical, even if the same, you may differ.
R3 : The alkylene group, aralkylene group R4 which may contain O or S of carbon numbers 1-10 : The alkylene group, aralkylene group which may contain O or S of 0 or carbon numbers 1-10.
[Formula 3]

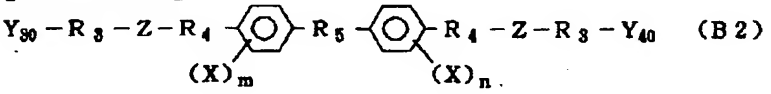


[Claim 2] The manufacture approach of the light emitting diode characterized by a refractive index closing a light-emitting part at least by 1.55 or more transparence resin when a light energy line is irradiated and at least one sort of monomers chosen from the following general formula (A2) and a general formula (B-2) carry out polymerization hardening, where [of light emitting diode] a light-emitting part is immersed at least.
[Formula 4]



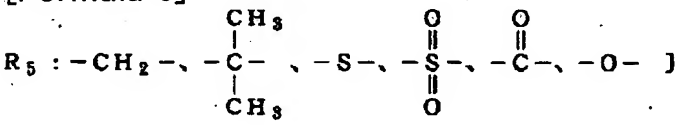
(A 2)

Xin [type: -- by the halogen atom l:0 except a fluorine or the integer Y10 of 1-4, and the Y20:functional group, even if the same, you may differ.
R1 R2 : ARUKI which may contain O or S of 0 or carbon numbers 1-10 The Wren radical, aralkylene group.]
[Formula 5]



(B 2)

Xin [type: -- by integer Z:O of the halogen atom m except a fluorine, n:0, or 1-4 or SY30, and the Y40:functional group, even if the same, you may differ.
R3 : The alkylene group, aralkylene group R4 which may contain O or S of carbon numbers 1-10 : The alkylene group, aralkylene group which may contain O or S of 0 or carbon numbers 1-10.
[Formula 6]



[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to light emitting diodes used for an advertisement, lighting, a liquid crystal panel or optical communication, and an optical circuit, such as LED and LD (laser diode). By closing the semiconductor chip of a light emitting diode by specific resin, it is high brightness and these components that are excellent in heatproof and moisture-proof ** endurance are offered.
[0002]
[Description of the Prior Art] Many proposals which close light emitting diodes, such as LED and LD, with resin conventionally are made. The purpose divides roughly and is mentioned two. One is for preventing degradation by the factor from the external environment of a chip by the resin seal. LED and LD chip have the influence of generation of heat at the time of luminescence, and a front face has plentifully oxidation degradation and the case which reaction-deteriorates, carries out adhesion degradation or causes an open circuit according to ambient atmospheres, such as surrounding gas and moisture. These are prevented by the resin seal.
[0003] Other purposes are for gathering optical ejection effectiveness and attaining high brightness-ization. That is, refractive indexes are the light emitting diode semiconductor chip of 2-6, and that a refractive index eases the phenomenon in which a light reflex is performed in an interface with the air space of 1.0, and emission light from a chip cannot be taken out efficiently. In order to solve this problem, it is required for a refractive index to close a chip according to the transparence quality of the material which has the middle value of a chip and air. Although glass or resin is mentioned as the transparence quality of the material, in consideration of productivity, a resin seal is common and many closures especially by epoxy system thermosetting resin are proposed.
[0004] However, the periodic table which is represented by the GaAs system ingredient Much LED which begins the semi-conductor which consists of an III-V group, and is used industrially, and the refractive index of LD chip are the three to 5 neighborhoods, and 1.6-2.0, and the becoming high refractive-index resin are required of the refractive index of the optimal resin for reducing interface reflection with these chips and an air space. A refractive index is 1.4 to about 1.5,

and, as for existing closure resin, reduction of sufficient interface reflection, i.e., optical ejection, was not performed. In addition, a refractive index given in this invention is a value at the time of measuring at 25 degrees C using the D line (589nm) of Na.

[0005]

[Problem(s) to be Solved by the Invention] This invention is high brightness and it aims at offering the resin seal light emitting diode which is excellent in thermal resistance, moisture resistance, and endurance with sufficient productivity. In order to raise the brightness of light emitting diode, it is required to take out efficiently the light which emitted light in a front face. If this point is further stated to a detail, the refractive index and the optical fetch effectiveness of resin have the following relation.

[0006] namely, the refractive index n0 of the semi-conductor whose optical ejection effectiveness is the ingredient of LED and LD, the refractive index n1 of closure resin, and an external environment -- namely, -- usually -- refractive index n2 of air from -- it can ask by calculating the reflection factor of the light in each interface, and optical ejection effectiveness becomes high, so that total of the reflection factor in each interface is small. When not carrying out a resin seal, it is this reflection factor R0. It is given by the degree type (1) in approximation.

[0007]

[Equation 1]

$$R_0=\left(\frac{n_0-n_2}{n_0+n_2}\right)^2 \qquad (1)$$

[0008] The total reflection factor R1 at the time of carrying out a resin seal Since it is the sum of the reflection factor of a chip-resin interface and a resin-external world interface, it is given by the degree type (2) in approximation.

[0009]

[Equation 2]

$$R_1=\left(\frac{n_0-n_1}{n_0+n_1}\right)^2+\left(\frac{n_1-n_2}{n_1+n_2}\right)^2 \qquad (2)$$

[0010] It is the refractive index n0 of LED and LD chip here. It carries out and is the periodic table. Since the external environment of n0 =3.66 and a component is usually air when the GaAs system which consists of an III-V group is taken for an example, when n2 =1.00, it is the reflection R0 when not carrying out a resin seal. It is set to R0 =0.33 from (1) type. That is, the light taken out effectively is LED and only 67% of the amount of luminescence of LD chip.

[0011] It is n1 when it closes by high refractive-index resin on the other hand. When the time of being 1.70 is taken for an example, it is R1 =0.23 (n0 =3.66, n1 =1.70, n2 =1.00).

A next door and 77% of the amount of luminescence are taken out. Incidentally it is a reflection factor R1. It is [0012] from (2) types to become min.

[Equation 3]

$$n_1=\sqrt{n_0}\cdot\sqrt{n_2} \qquad (3)$$

[0013] It is at the ** time. That is, in the case of the above-mentioned example

(n0 =3.66, n2 =1.00), at the time of n1 =1.91, a reflection factor serves as min and R1 =0.20 and 80% of the amount of luminescence of a chip are taken out out of a system. Therefore, when using the semiconductor diode of a high refractive index, the resin of a high refractive index is needed.

[0014] Moreover, also in case LED and LD chip are closed in two steps using two resin with which refractive indexes differ, considering as a high refractive index is effective. That is, if the thing of a low refractive index is used as the 2nd step of closure resin which covers a it top, using high refractive-index resin as closure resin which touches a direct chip, the total reflection factor can be reduced further. For example, when the high refractive-index resin of refractive-index n1=1.70 is used for the 1st step, the low refractive-index resin of refractive-index n1 '=1.40 is used for the 2nd step and it closes, it is the total reflection factor R2. It is [0015] when the above-mentioned GaAs system is taken for an example.

[Equation 4]

$$R_2=\left(\frac{n_0-n_1}{n_0+n_1}\right)^2+\left(\frac{n_1-n_1'}{n_1+n_1'}\right)^2+\left(\frac{n_1'-n_2}{n_1'+n_2}\right)^2=0.17$$

$(n_0=3.66,\ n_1=1.70,\ n_1'=1.40,\ n_2=1.00)$

[0016] A next door and optical ejection effectiveness become 83%. Thus, even if it faces carrying out a resin seal in two or more steps, as for LED and the 1st step of resin which touches LD chip directly, it is desirable that it is a high refractive index. Although LED and the optical ejection effectiveness of LD chip have been guessed from the interface reflection factor above, high refractive-index-ization of closure resin enlarges, the include angle, i.e., the critical angle, of total reflection in a chip-resin interface, and contributes also to improvement in optical ejection effectiveness. The critical angle theta of total reflection [in / as shown in drawing 4 / the chip side D] (include angle which receives perpendicularly) is the refractive index n0 of the semi-conductor layer A. Refractive index n1 of closure resin It is given according to a degree type (4).

[0017]

[Equation 5]

$$\theta=\sin^{-1}\left(\frac{n_1}{n_0}\right) \qquad (4)$$

[0018] That is, the refractive index of closure resin becomes large and it is n1. Refractive index n0 of the semi-conductor layer A The range which the critical angle theta becomes large and carries out outgoing radiation to the resin layer C becomes large, so that it approaches. The critical angle theta becomes theta= 27.7 degrees, when a GaAs system (n0 =3.66) is used as a semiconductor chip, and it closes by the resin of a refractive index 1.40 and closes by the resin of the theta= 22.5-degree refractive index 1.70 according to a formula (4). [0019] which can ask for the outgoing radiation area S on a chip side according to a degree type (5) from this include angle

[Equation 6] S=pi d tan2 theta [0020] d is the thickness of the semi-conductor layer A here. Outgoing radiation area S2 at the time of closing by the outgoing

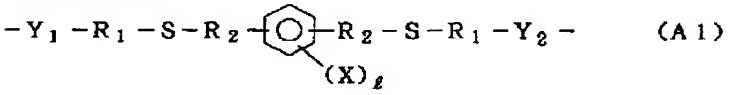
radiation area S1 at the time of closing by the resin of the above-mentioned refractive index 1.40, and the resin of a refractive index 1.70 It turns out that it is set to S1 =0.171pidS2 =0.275pid, respectively, and outgoing radiation area becomes large about 1.6 times by high refractive-index-ization of resin. That is, the light which carried out outgoing radiation from the PN-junction side of a semiconductor chip can be taken out efficiently.

[0021]

[Means for Solving the Problem] this invention persons found out that optical ejection effectiveness improved and light emitting diodes, such as LED of high brightness and LD component, were obtained with sufficient productivity by closing light emitting diode with the specific transparence resin of high refraction, as a result of inquiring wholeheartedly, in order to solve the above-mentioned technical problem. Moreover, by using for intramolecular the polyfunctional light and/or thermosetting resin which have two or more polymerization nature functional groups, the component which is excellent in thermal resistance, moisture resistance, and endurance can be manufactured. This invention is in the light emitting diode to which the closure of the light-emitting part was carried out at least with the with a refractive indexes of 1.55 or more which consist of a polymer of the structural unit more than a kind at least transparence resin chosen from the following general formula (A1) and a general formula (B1).

[0022]

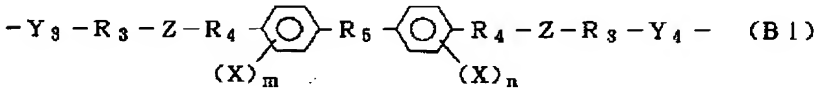
[Formula 7]



[0023] Xin [type: -- the halogen atom l:0 except a fluorine or the integer Y1 of 1-4, and Y2 : By the joint radical, even if the same, you may differ.
R1, R2 : The alkylene group, aralkylene group which may contain O or S of 0 or carbon numbers 1-10.]

[0024]

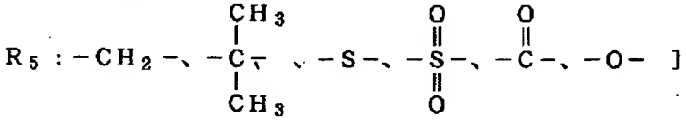
[Formula 8]



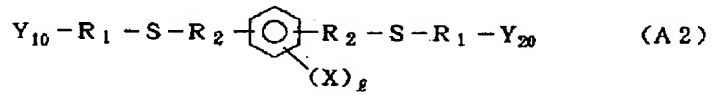
[0025] Xin [type: -- integer Z:O of the halogen atom m except a fluorine, n:0, or 1-4 or SY3, and Y4 : By the joint radical, even if the same, you may differ.
R3 : The alkylene group, aralkylene group R4 which may contain O or S of carbon numbers 1-10 : The alkylene group, aralkylene group which may contain O or S of 0 or carbon numbers 1-10.

[0026]

[Formula 9]

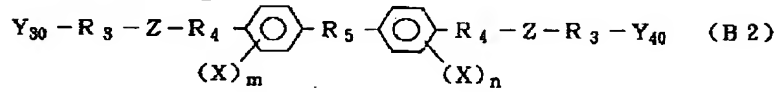


[0027] In order to attain high refractive-index-ization of resin generally, it is effective if ** ring, ** sulfur atom, and the halogen atom except ** fluorine are introduced into a molecule frame or a chain. this invention persons checked that it could be used as a monomer (A2) effective in this invention, and (B-2) by making each one or more ends combine with the both-ends section of these structural units light and/or the functional group which carries out thermal polymerization by the above-mentioned formula (A1) and (B1) paying attention to the resin which has the structural unit by which a formula is carried out serving as a high refractive index.
[0028]
[Embodiment of the Invention] With a refractive indexes of 1.55 or more transparence resin usable as closure resin of this invention is obtained light and/or by carrying out heat curing in the transparency liquid monomer of the following general formula (A2) and a general formula (B-2).
[0029]
[Formula 10]



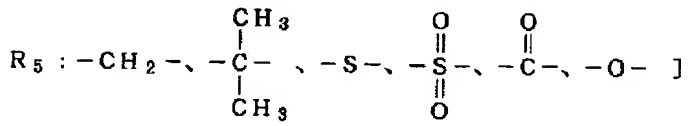
(A2)

[0030] Xin [type: -- by the halogen atom l:0 except a fluorine or the integer Y10 of 1-4, and the Y20:functional group, even if the same, you may differ.
R1, R2 : The alkylene group, aralkylene group which may contain O or S of 0 or carbon numbers 1-10.]
[0031]
[Formula 11]



(B2)

[0032] Xin [type: -- by integer Z:O of the halogen atom m except a fluorine, n:0, or 1-4 or SY30, and the Y40:functional group, even if the same, you may differ.
R3 : The alkylene group, aralkylene group R4 which may contain O or S of carbon numbers 1-10 : The alkylene group, aralkylene group which may contain O or S of 0 or carbon numbers 1-10.
[0033]
[Formula 12]

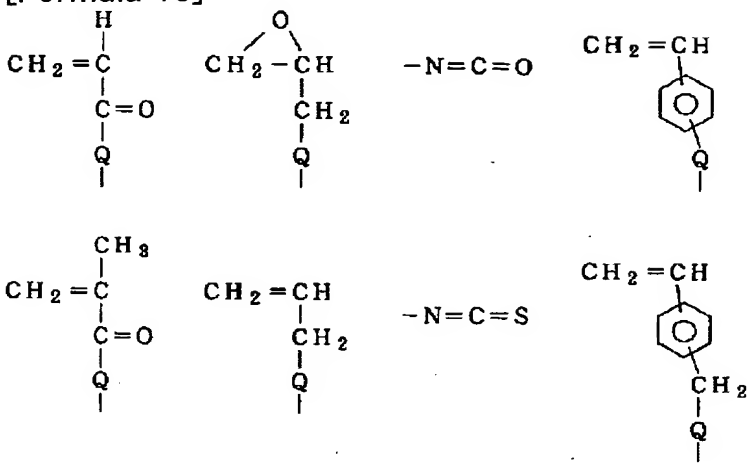


[0034] As polymerization nature functional groups Y10, Y20, Y30, and Y40, an acryloyl radical as (meta) shown by the degree type, a glycidyl group, an aryl group, an isocyanate radical, an isothiocyanate radical, a vinyl phenyl group, a vinylbenzyl radical, etc. are mentioned. These monomers are polyfunctional monomers which have two or more polymerization nature functional groups in intramolecular, and the polymer is excellent in thermal resistance and moisture resistance as a photo-

setting resin or thermosetting resin.

[0035]

[Formula 13]

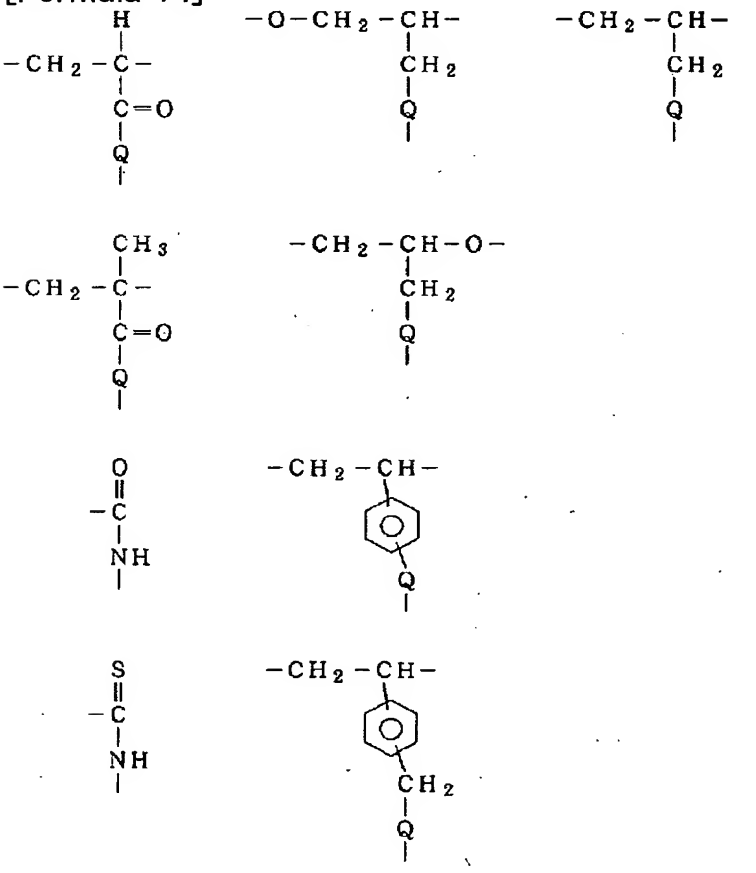


QはS又はO

[0036] Therefore, the joint radicals Y1, Y2, Y3, and Y4 serve as the following structure.

[0037]

[Formula 14]



QはS又はO

As a monomer which has the structural unit of a general formula (A2) For example,

p-screw (beta-(meta) acryloyloxyethyl thio) xylylene, m-screw (beta-(meta) acryloyloxyethyl thio) xylylene, p-screw (beta-(meta) acryloyloxyethyl thio ethyl thio) xylylene, m-screw (beta-(meta) acryloyloxyethyl thio ethyl thio) xylylene, p-screw (beta-(meta) acryloyloxyethyl oxy-ethyl thio) xylylene, m-screw (beta-(meta) acryloyloxyethyl oxy-ethyl thio) xylylene, alpha and alpha'-screw (beta-(meta) acryloyloxyethyl thio) - 2, 3, 5, 6-tetra-chloro-p-xylylene, alpha and alpha'-screw (beta-(meta) acryloyloxyethyl thio) - 2, 3, 5, 6-tetra-chloro-m-xylylene, alpha and alpha'-screw (beta-(meta) acryloyloxyethyl thio) - 2, 3, 5, 6-tetrabromo-p-xylylene, alpha and alpha'-screw (beta-(meta) acryloyloxyethyl thio) - 2, 3, 5, 6-tetrabromo-m-xylylene, p-screw (beta-(meta) acryloyl thio ethyl thio) xylylene, m-screw (beta-(meta) acryloyl thio ethyl thio) xylylene, p-screw (beta-(meta) acryloyl thio ethyl CHIOECHIRUCHIO) xylylene, m-screw (beta-(meta) acryloyl thio ethyl CHIOECHIRUCHIO) xylylene, p-screw (beta-(meta) acryloyl thio ethyloxy ECHIRUCHIO) xylylene, m-screw (beta-(meta) acryloyl thio ethyloxy ECHIRUCHIO) xylylene, alpha and alpha'-screw (beta-(meta) acryloyl thio ethyl thio) - 2, 3, 5, 6-tetra-chloro-p-xylylene, alpha and alpha'-screw (beta-(meta) acryloyl thio ethyl thio) - 2, 3, 5, 6-tetra-chloro-m-xylylene, alpha and alpha'-screw (beta-(meta) acryloyl thio ethyl thio) - 2, 3, 5, 6-tetrabromo-p-xylylene, alpha and alpha'-screw (beta-(meta) acryloyl thio ethyl thio) - 2, 3, 5, a di(meth) acrylate compound like the 6-tetrabromo-m-xylylene, [0038] p-screw (beta-glycidyloxy ethyl thio) xylylene, m-screw (beta-glycidyloxy ethyl thio) xylylene, The epoxy compound of p-screw (beta-glycidyl thio ethyl thio) xylylene and m-screw (beta-glycidyl thio ethyl thio) xylylene, The diaryl compound of p-screw (beta-allyloxy ethyl thio) xylylene, m-screw (beta-allyloxy ethyl thio) xylylene, p-screw (beta-arylthio ethyl thio) xylylene, and m-screw (beta-arylthio ethyl thio) xylylene, [0039] The diisocyanate compound of p-screw (beta-isocyanato ethyl thio) xylylene and m-screw (beta-isocyanato ethyl thio) xylylene, The JIISO thiocyanate compound of p-screw (beta-iso CHIOSHIANATO ethyl thio) xylylene and m-screw (beta-iso CHIOSHIANATO ethyl thio) xylylene, p-screw [2-(4-vinyl phenyloxy) ethyl thio] xylylene, m-screw [2-(4-vinyl phenyloxy) ethyl thio] xylylene, p-screw [2-(4-vinyl phenylthio) ethyl thio] xylylene, m-screw [2-(4-vinyl phenylthio) ethyl thio] xylylene, p-screw [2-(4-vinylbenzyl oxy-) ethyl thio] xylylene, A styrene system compound like m-screw [2-(4-vinylbenzyl oxy-) ethyl thio] xylylene, p-screw [2-(4-vinylbenzyl thio) ethyl thio] xylylene, and m-screw [2-(4-vinylbenzyl thio) ethyl thio] xylylene is mentioned.

[0040] As a monomer which has the structural unit of a general formula (B-2) For example, 4 and 4'-screw (2-(meta) acryloyloxyethyl thio) diphenylsulfone, 4 and 4'-screw (2-(meta) acryloyloxyethyl thio ethyl thio) diphenylsulfone, 4 and 4'-screw (2-(meta) acryloyloxyethyl oxy-ethyl thio) diphenylsulfone, 4 and 4'-screw (2-(meta) acryloyloxyethyl thio) -3, 3', 5, and 5'-tetrabromo diphenylsulfone, 4 and 4'-screw (2-(meta) acryloyloxyethyl thio ethyl thio) -3, 3', 5, and 5'-tetrabromo diphenylsulfone, 4 and 4'-screw (2-(meta) acryloyloxyethyl oxy-ethyl thio) -3, 3', 5, and 5'-tetrabromo diphenylsulfone, 4 and 4'-screw (2-(meta) acryloyloxyethyl oxy-) diphenylsulfone, 4 and 4'-screw (2-(meta) acryloyloxyethyl thio ethyloxy) diphenylsulfone, 4 and 4'-screw (2-(meta) acryloyloxyethyl oxy-ethyloxy) diphenylsulfone, 4 and 4'-screw (2-(meta) acryloyloxyethyl oxy-) -3, 3', 5, and 5'-

tetrabromo diphenylsulfone, 4 and 4'-screw (2-(meta) acryloyloxyethyl thio ethyloxy) -3, 3', 5, and 5'-tetrabromo diphenylsulfone, 4 and 4'-screw (2-(meta) acryloyloxyethyl oxy-ethyloxy) -3, 3', 5, and 5'-tetrabromo diphenylsulfone, 4 and 4'-screw (2-(meta) acryloyl thio ethyl thio) diphenylsulfone, 4 and 4'-screw (2-(meta) acryloyl thio ethyl CHIOECHIRUCHIO) diphenylsulfone, 4 and 4'-screw (2-(meta) acryloyl thio ethyloxy ECHIRUCHIO) diphenylsulfone, 4 and 4'-screw (2-(meta) acryloyl thio ethyl thio) -3, 3', 5, and 5'-tetrabromo diphenylsulfone, 4 and 4'-screw (2-(meta) acryloyl thio ethyl CHIOECHIRUCHIO) -3, 3', 5, and 5'-tetrabromo diphenylsulfone, 4 and 4'-screw (2-(meta) acryloyl thio ethyloxy ECHIRUCHIO) -3, 3', 5, and 5'-tetrabromo diphenylsulfone, 4 and 4'-screw (2-(meta) acryloyl thio ethyloxy) diphenylsulfone, 4 and 4'-screw (2-(meta) acryloyl thio ECHIRUCHIO ethyloxy) diphenylsulfone, 4 and 4'-screw (2-(meta) acryloyl thio ethyloxy ethyloxy) diphenylsulfone, 4 and 4'-screw (2-(meta) acryloyl thio ethyloxy) -3, 3', 5, and 5'-tetrabromo diphenylsulfone, 4 and 4'-screw (2-(meta) acryloyl thio ECHIRUCHIO ethyloxy) -3, 3', 5, and 5'-tetrabromo diphenylsulfone, 4 and 4'-screw (2-(meta) acryloyl thio ethyloxy ethyloxy) -3, 3', 5, and 5'-tetrabromo diphenylsulfone, A 4 and 4'-screw (2-(meta) acryloyloxyethyl thio) diphenyl sulfide, A 4 and 4'-screw (2-(meta) acryloyloxyethyl thio ethyl thio) diphenyl sulfide, A 4 and 4'-screw (2-(meta) acryloyloxyethyl oxy-ethyl thio) diphenyl sulfide, A 4 and 4'-screw (2-(meta) acryloyloxyethyl thio) -3, 3', 5, and 5'-tetrabromo diphenyl sulfide, A 4 and 4'-screw (2-(meta) acryloyloxyethyl thio ethyl thio) -3, 3', 5, and 5'-tetrabromo diphenyl sulfide, A 4 and 4'-screw (2-(meta) acryloyloxyethyl oxy-ethyl thio) -3, 3', 5, and 5'-tetrabromo diphenyl sulfide, A 4 and 4'-screw (2-(meta) acryloyloxyethyl oxy-) diphenyl sulfide, A 4 and 4'-screw (2-(meta) acryloyloxyethyl thio ethyloxy) diphenyl sulfide, A 4 and 4'-screw (2-(meta) acryloyloxyethyl oxy-ethyloxy) diphenyl sulfide, A 4 and 4'-screw (2-(meta) acryloyloxyethyl oxy-) -3, 3', 5, and 5'-tetrabromo diphenyl sulfide, A 4 and 4'-screw (2-(meta) acryloyloxyethyl thio ethyloxy) -3, 3', 5, and 5'-tetrabromo diphenyl sulfide, A 4 and 4'-screw (2-(meta) acryloyloxyethyl oxy-ethyloxy) -3, 3', 5, and 5'-tetrabromo diphenyl sulfide, A 4 and 4'-screw (2-(meta) acryloyl thio ethyl thio) diphenyl sulfide, A 4 and 4'-screw (2-(meta) acryloyl thio ethyl CHIOECHIRUCHIO) diphenyl sulfide, A 4 and 4'-screw (2-(meta) acryloyl thio ethyloxy ECHIRUCHIO) diphenyl sulfide, A 4 and 4'-screw (2-(meta) acryloyl thio ethyl thio) -3, 3', 5, and 5'-tetrabromo diphenyl sulfide, A 4 and 4'-screw (2-(meta) acryloyl thio ethyl CHIOECHIRUCHIO) -3, 3', 5, and 5'-tetrabromo diphenyl sulfide, A 4 and 4'-screw (2-(meta) acryloyl thio ethyloxy ECHIRUCHIO) -3, 3', 5, and 5'-tetrabromo diphenyl sulfide, A 4 and 4'-screw (2-(meta) acryloyl thio ethyloxy) diphenyl sulfide, A 4 and 4'-screw (2-(meta) acryloyl thio ECHIRUCHIO ethyloxy) diphenyl sulfide, A 4 and 4'-screw (2-(meta) acryloyl thio ethyloxy ethyloxy) diphenyl sulfide, A 4 and 4'-screw (2-(meta) acryloyl thio ethyloxy) -3, 3', 5, and 5'-tetrabromo diphenyl sulfide, A 4 and 4'-screw (2-(meta) acryloyl thio ECHIRUCHIO ethyloxy) -3, 3', 5, and 5'-tetrabromo diphenyl sulfide, 4 and 4'-screw (2-(meta) acryloyl thio ethyloxy ethyloxy) -3, 3', 5, and 5'-tetrabromo diphenyl sulfide, 4, and 4'-screw (2-(meta) acryloyloxyethyl thio) JIFENIRUKE Ton, 4, and 4'-screw (2-(meta) acryloyloxyethyl thio ethyl thio) diphenyl ketone, 4 and 4'-screw (2-(meta) acryloyloxyethyl oxy-ethyl thio) diphenyl ketone, 4 and 4'-

screw (2-(meta) acryloyloxyethyl thio) -3, 3', 5, and 5'-tetrabromo diphenyl ketone, 4 and 4'-screw (2-(meta) acryloyloxyethyl thio ethyl thio) -3, 3', 5, and 5'-tetrabromo diphenyl ketone, 4 and 4'-screw (2-(meta) acryloyloxyethyl oxy-ethyl thio) 3, 3', 5, and 5'-tetrabromo diphenyl ketone, 4 and 4'-screw (2-(meta) acryloyloxyethyl oxy-) diphenyl ketone, 4 and 4'-screw (2-(meta) acryloyloxyethyl thio ethyloxy) diphenyl ketone, 4 and 4'-screw (2-(meta) acryloyloxyethyl oxy-ethyloxy) diphenyl ketone, 4 and 4'-screw (2-(meta) acryloyloxyethyl oxy-) -3, 3', 5, and 5'-tetrabromo diphenyl ketone, 4 and 4'-screw (2-(meta) acryloyloxyethyl thio ethyl thio oxy-) -3, 3', 5, and 5'-tetrabromo diphenyl ketone, 4 and 4'-screw (2-(meta) acryloyloxyethyl oxy-ethyloxy) 3, 3', 5, and 5'-tetrabromo diphenyl ketone, 4 and 4'-screw (2-(meta) acryloyl thio ethyl thio) diphenyl ketone, 4 and 4'-screw (2-(meta) acryloyl thio ethyl CHIOECHIRUCHIO) diphenyl ketone, 4 and 4'-screw (2-(meta) acryloyl thio ethyloxy ECHIRUCHIO) diphenyl ketone, 4 and 4'-screw (2-(meta) acryloyl thio ethyl thio) -3, 3', 5, and 5'-tetrabromo diphenyl ketone, 4 and 4'-screw (2-(meta) acryloyl thio ethyl CHIOECHIRUCHIO) -3, 3', 5, and 5'-tetrabromo diphenyl ketone, 4 and 4'-screw (2-(meta) acryloyl thio ethyloxy ECHIRUCHIO) -3, 3', 5, and 5'-tetrabromo diphenyl ketone, 4 and 4'-screw (2-(meta) acryloyl thio ethyloxy) diphenyl ketone, 4 and 4'-screw (2-(meta) acryloyl thio ECHIRUCHIO ethyloxy) diphenyl ketone, 4 and 4'-screw (2-(meta) acryloyl thio ethyloxy ethyloxy) diphenyl ketone, 4 and 4'-screw (2-(meta) acryloyl thio ethyloxy) -3, 3', 5, and 5'-tetrabromo diphenyl ketone, 4 and 4'-screw (2-(meta) acryloyl thio ethyl CHIOECHIRUCHIOOKISHI) -3, 3', 5, and 5'-tetrabromo diphenyl ketone, 4 and 4'-screw (2-(meta) acryloyl thio ethyloxy ethyloxy) 3, 3', 5, and 5'-tetrabromo diphenyl ketone, 4 and 4'-screw (2-(meta) acryloyloxyethyl thio) diphenylmethane, 4 and 4'-screw (2-(meta) acryloyloxyethyl thio ethyl thio) diphenylmethane, 4 and 4'-screw (2-(meta) acryloyloxyethyl oxy-ethyl thio) diphenylmethane, 4 and 4'-screw (2-(meta) acryloyloxyethyl thio) -3, 3', 5, and 5'-tetrabromo diphenylmethane, 4 and 4'-screw (2-(meta) acryloyloxyethyl thio ethyl thio) -3, 3', 5, and 5'-tetrabromo diphenylmethane, 4 and 4'-screw (2-(meta) acryloyloxyethyl oxy-ethyl thio) -3, 3', 5, and 5'-tetrabromo diphenylmethane, 4 and 4'-screw (2-(meta) acryloyloxyethyl oxy-) diphenylmethane, 4 and 4'-screw (2-(meta) acryloyloxyethyl thio ethyloxy) diphenylmethane, 4 and 4'-screw (2-(meta) acryloyloxyethyl oxy-ethyloxy) diphenylmethane, 4 and 4'-screw (2-(meta) acryloyloxyethyl oxy-) -3, 3', 5, and 5'-tetrabromo diphenylmethane, 4 and 4'-screw (2-(meta) acryloyloxyethyl thio ethyloxy) -3, 3', 5, and 5'-tetrabromo diphenylmethane, 4 and 4'-screw (2-(meta) acryloyloxyethyl oxy-ethyloxy) -3, 3', 5, and 5'-tetrabromo diphenylmethane, 4 and 4'-screw (2-(meta) acryloyl thio ethyl thio) diphenylmethane, 4 and 4'-screw (2-(meta) acryloyl thio ethyl CHIOECHIRUCHIO) diphenylmethane, 4 and 4'-screw (2-(meta) acryloyl thio ethyloxy ECHIRUCHIO) diphenylmethane, 4 and 4'-screw (2-(meta) acryloyl thio ethyl thio) -3, 3', 5, and 5'-tetrabromo diphenylmethane, 4 and 4'-screw (2-(meta) acryloyl thio ethyl CHIOECHIRUCHIO) -3, 3', 5, and 5'-tetrabromo diphenylmethane, 4 and 4'-screw (2-(meta) acryloyl thio ethyloxy ECHIRUCHIO) -3, 3', 5, and 5'-tetrabromo diphenylmethane, 4 and 4'-screw (2-(meta) acryloyl thio ethyloxy) diphenylmethane, 4 and 4'-screw (2-(meta) acryloyl thio ECHIRUCHIO ethyloxy) diphenylmethane, 4 and 4'-screw (2-(meta) acryloyl thio ethyloxy

ethyloxy) diphenylmethane, 4 and 4'-screw (2-(meta) acryloyl thio ethyloxy) -3, 3', 5, and 5'-tetrabromo diphenylmethane, 4 and 4'-screw (2-(meta) acryloyl thio ECHIRUCHIO ethyloxy) -3, 3', 5, and 5'-tetrabromo diphenylmethane, 4 and 4'-screw (2-(meta) acryloyl thio ethyloxy ethyloxy) 3, 3', 5, and 5'-tetrabromo diphenylmethane, 2 and 2-screw [4-(beta-(meta) acryloyloxyethyl thio) phenyl] propane, 2 and 2-screw [4-(beta-(meta) acryloyloxyethyl thio ethyl thio) phenyl] propane, 2, 2-screw [4 - (beta-(meta) acryloyloxyethyl oxy-ethyl) Thio phenyl] propane, 2, and 2-screw [4-(beta-(meta) acryloyloxyethyl thio)-3, 3', 5, and 5'-tetrabromo phenyl] propane, 2 and 2-screw [4-(beta-(meta) acryloyloxyethyl thio ethyl thio)-3, 3', 5, and 5'-tetrabromo phenyl] propane, 2 and 2-screw [4-(beta-(meta) acryloyloxyethyl oxy-ethyl thio)-3, 3', 5, and 5'-tetrabromo phenyl] propane, 2 and 2-screw [4-(beta-(meta) acryloyloxyethyl oxy-) phenyl] propane, 2 and 2-screw [4-(beta-(meta) acryloyloxyethyl thio ethyloxy) phenyl] propane, 2 and 2-screw [4-(beta-(meta) acryloyloxyethyl oxy-ethyloxy) phenyl] propane, 2 and 2-screw [4-(beta-(meta) acryloyloxyethyl oxy-)-3, 3', 5, and 5'-tetrabromo diphenyl] propane, 2 and 2-screw [4-(beta-(meta) acryloyloxyethyl thio ethyloxy)-3, 3', 5, and 5'-tetrabromo phenyl] propane, 2 and 2-screw [4-(beta-(meta) acryloyloxyethyl oxy-ethyloxy)-3, 3', 5, and 5'-tetrabromo diphenyl] propane, 2 and 2-screw [4-(beta-(meta) acryloyl thio ethyl thio) phenyl] propane, 2 and 2-screw [4-(beta-(meta) acryloyl thio ethyl CHIOECHIRUCHIO) phenyl] propane, 2 and 2-screw [4- (a beta-(meta) acryloyl CHIOECHIRUOKISHI ethyl thiophenyl] propane --) 2 and 2-screw [4-(beta-(meta) acryloyl thio ethyl thio)-3, 3', 5, and 5'-tetrabromo phenyl] propane, 2 and 2-screw [4-(beta-(meta) acryloyl thio ethyl CHIOECHIRUCHIO)-3, 3', 5, and 5'-tetrabromo phenyl] propane, 2 and 2-screw [4-(beta-(meta) acryloyl thio ethyloxy ECHIRUCHIO)-3, 3', 5, and 5'-tetrabromo phenyl] propane, 2 and 2-screw [4-(beta-(meta) acryloyl thio ethyloxy) phenyl] propane, 2 and 2-screw [4-(beta-(meta) acryloyl thio ECHIRUCHIO ethyloxy) phenyl] propane, 2 and 2-screw [4-(beta-(meta) acryloyl thio ethyloxy ethyloxy) phenyl] propane, 2 and 2-screw [4-(beta-(meta) acryloyl thio ethyloxy)-3, 3', 5, and 5'-tetrabromo phenyl] propane, 2 and 2-screw [4-(beta-(meta) acryloyl thio ECHIRUCHIO ethyloxy)-3, 3', 5, and 5'-tetrabromo phenyl] propane, 2 and 2-screw [4-(beta-(meta) acryloyloxyethyl thio ethyl thio) phenyl] ether, 2 and 2-screw [4-(beta-(meta) acryloyloxyethyl oxy-ethyl thio) phenyl] ether, 2 and 2-screw [4-(beta-(meta) acryloyloxyethyl thio)-3, 3', 5, and 5'-tetrabromo phenyl] ether, 2 and 2-screw [4-(beta-(meta) acryloyloxyethyl thio ethyl thio)-3, 3', 5, and 5'-tetrabromo phenyl] ether, 2 and 2-screw [4-(beta-(meta) acryloyloxyethyl oxy-ethyl thio)-3, 3', 5, and 5'-tetrabromo phenyl] ether, 2 and 2-screw [4-(beta-(meta) acryloyloxyethyl oxy-) phenyl] ether, 2 and 2-screw [4-(beta-(meta) acryloyloxyethyl thio ethyloxy) phenyl] ether, 2 and 2-screw [4-(beta-(meta) acryloyloxyethyl oxy-ethyloxy) phenyl] ether, 2 and 2-screw [4-(beta-(meta) acryloyloxyethyl oxy-)-3, 3', 5, and 5'-tetrabromo diphenyl] ether, 2 and 2-screw [4-(beta-(meta) acryloyloxyethyl thio ethyloxy)-3, 3', 5, and 5'-tetrabromo phenyl] ether, 2 and 2-screw [4-(beta-(meta) acryloyloxyethyl oxy-ethyloxy)-3, 3', 5, and 5'-tetra-BUROJI phenyl] ether, 2 and 2-screw [4-(beta-(meta) acryloyl thio ethyl thio) phenyl] ether, 2 and 2-screw [4-(beta-(meta) acryloyl thio ethyl CHIOECHIRUCHIO) phenyl] ether, 2 and 2-screw [4-(beta-(meta) acryloyl thio

ethyloxy ECHIRUCHIO) phenyl] ether, 2 and 2-screw [4-(beta-(meta) acryloyl thio ethyl thio)-3, 3', 5, and 5'-tetrabromo phenyl] ether, 2 and 2-screw [4-(beta-(meta) acryloyl thio ethyl CHIOECHIRUCHIO)-3, 3', 5, and 5'-tetrabromo phenyl] ether, 2 and 2-screw [4-(beta-(meta) acryloyl thio ethyloxy ECHIRUCHIO)-3, 3', 5, and 5'-tetrabromo phenyl] ether, 2 and 2-screw [4-(beta-(meta) acryloyl thio ethyloxy) phenyl] ether, 2 and 2-screw [4-(beta-(meta) acryloyl thio ECHIRUCHIO ethyloxy) phenyl] ether, 2 and 2-screw [4-(beta-(meta) acryloyl thio ethyloxy ethyloxy) phenyl] ether, 2 and 2-screw [4-(beta-(meta) acryloyl thio ethyloxy)-3, 3', 5, and 5'-tetrabromo phenyl] ether, 2 and 2-screw [4-(beta-(meta) acryloyl thio ECHIRUCHIO ethyloxy)-3, 3', 5, and 5'-tetrabromo phenyl] ether, An acrylate compound like 2 and 2-screw [4-(beta-(meta) acryloyl thio ethyloxy ethyloxy)-3, 3', 5, and 5'-tetrabromo phenyl] ether (meta), [0041] 4 and 4'-screw (2-glycidyloxy ethyl thio) diphenylsulfone, 4, and 4'-screw (2-glycidyloxy ethyloxy) diphenylsulfone, 2, and 2-screw [4-(beta-glycidyloxy ethyl thio) phenyl] propane, 2, 2-screw [4 - (beta-GU) The epoxy compound of RISHIJIRU oxy-ethyl OKISHIO phenyl] propane, 4, and 4'-screw (2-glycidyl thio ethyl thio) diphenylsulfone, 4, and 4'-screw (2-glycidyl thio ethyloxy) diphenylsulfone, 2, and 2-screw [4-(beta-glycidyl thio ethyl thio) phenyl] propane, 2, and 2-screw [4-(beta-glycidyl thio ethyloxy) phenyl] propane, [0042] 4 and 4'-screw (2-allyloxy ethyl thio) diphenylsulfone, 4 and 4'-screw (2-allyloxy ethyloxy) diphenylsulfone, 2 and 2-screw [4-(beta-allyloxy ethyl thio) phenyl] propane, 2 and 2-screw [4-(beta-allyloxy ethyloxy) phenyl] propane, 4 and 4'-screw (2-arylthio ethyl thio) diphenylsulfone, The diaryl compound of 4 and 4'-screw (2-arylthio ethyloxy) diphenylsulfone, 2, and 2-screw [4-(beta-arylthio ethyl thio) phenyl] propane, 2, and 2-screw [4-(beta-arylthio ethyloxy) phenyl] propane, [0043] The diisocyanate compound of 4 and 4'-screw (2-isocyanato ethyl thio) diphenylsulfone, 4, and 4'-screw (2-isocyanato ethyloxy) diphenylsulfone, 2, and 2-screw [4-beta-isocyanato ethyl thio phenyl] propane, 2, and 2-screw [4-beta-isocyanato ethyloxy phenyl] propane, [0044] The JIISO thiocyanate compound of 4 and 4'-screw (2-iso CHIOSHIANATO ethyl thio) diphenylsulfone, 4, and 4'-screw (2-iso thio SHIANATO ethyloxy) diphenylsulfone, 2, and 2-screw [4-beta-iso CHIOSHIANATO ethyl thio phenyl] propane, 2, and 2-screw [4-beta-iso thio SHIANATO ethyloxy phenyl] propane, [0045] 4 and 4'-screw [2-(4-vinyl phenyloxy) ethyl thio] diphenylsulfone, 4 and 4'-screw [2-(4-vinyl phenyloxy) ethyloxy] diphenylsulfone, 2 and 2-screw {4-[2-(4-vinyl phenyloxy) ethyl thio] phenyl} propane, 2 and 2-screw {4-[2-(4-vinyl phenyloxy) ethyloxy] phenyl} propane, 4 and 4'-screw [2-(4-vinyl phenylthio) ethyl thio] diphenylsulfone, 4 and 4'-screw [2-(4-vinyl phenylthio) ethyloxy] diphenylsulfone, 2 and 2-screw {4-[2-(4-vinyl phenylthio) ethyl thio] phenyl} propane, 2 and 2-screw {4-[2-(4-vinyl phenylthio) ethyloxy] phenyl} propane, 4 and 4'-screw [2-(4-vinylbenzyl oxy-) ethyl thio] diphenylsulfone, 4 and 4'-screw [2-(4-vinylbenzyl oxy-) ethyloxy] diphenylsulfone, 2 and 2-screw {4-[2-(4-vinylbenzyl oxy-) ethyl thio] phenyl} propane, 2 and 2-screw {4-[2-(4-vinylbenzyl oxy-) ethyloxy] phenyl} propane, 4 and 4'-screw [2-(4-vinylbenzyl thio) ethyl thio] diphenylsulfone, 4 and 4'-screw [2-(4-vinylbenzyl thio) ethyloxy] diphenylsulfone, A styrene system compound like 2 and 2-screw {4-[2-(4-vinylbenzyl thio) ethyl thio] phenyl} propane, 2, and 2-screw {4-[2-(4-vinylbenzyl thio) ethyloxy] phenyl}

propane is mentioned.
[0046] These desirable are di(meth)acrylate compounds and especially a desirable thing is p-screw (beta-methacryloiloxy-ethyl thio) xylylene and p-screw (it is the constituent of beta-methacryloyl thio ECHIRUCHIONO xylylene, 4, and 4'-screw (2-methacryloiloxy-ethyl thio) diphenylsulfone, 4, and 4'-screw (2-methacryloyl thio ethyl thio) diphenylsulfone, and a these monomers and the monomer which can be copolymerized.).
[0047] As the monomer and the monomer which can be copolymerized which has the structural unit of a general formula (A2) and/or a general formula (B-2) For example, methyl (meta) acrylate, phenyl (meta) acrylate, 2-hydroxyethyl (meta) acrylate, a methacryloyloxy methyl tetracyclo decane, Methacryloyl oxymethyl tetracyclo dodecen, ethylene GURIKORUJI (meta) acrylate, A 1, 6-hexane JIORUJI (meta) acrylate, 2, and 2'-screw [4-(beta-methacryloyloxy ethoxy) cyclohexyl] propane, 1, 4-screw (methacryloyloxy methyl) cyclohexane, TORIMECHI roll pro pantry (meta) acrylate, Styrene, KURORU styrene, alpha methyl styrene, the acrylate compound and styrene system compound like a divinylbenzene, Pentaerythritol tetrakis (beta-thiopropionate), pentaerythritol tetrakis (beta-thioglycolate), Trimethylol propane tris (beta-thiopropionate), trimethylol propane tris (beta-thioglycolate), A diethylene-glycol screw (beta-thiopropionate), a diethylene-glycol screw (beta-thioglycolate), A triethylene glycol screw (beta-thiopropionate), a triethylene glycol screw (beta-thioglycolate), Dipentaerythritol hexa kiss (beta-thiopropionate), dipentaerythritol hexa kiss (beta-thioglycolate), Tris [2-(beta-thio propionyloxy) ethyl] TORIISOSHIA nurate, Tris [2-(beta-thio propionyloxy ethoxy) ethyl] TORIISOSHIA nurate, Tris [3-(beta-thio propionyloxy) propyl] TORIISOSHIA nurate, Tris (2-thio GURIKONIRU oxy-ethyl) TORIISOSHIA nurate, Tris (2-thio GURIKONIRU oxyethoxy ethyl) TORIISOSHIA nurate, The poly thiol of a tris (3-thio GURIKONIRU oxy-propyl) TORIISOSHIA nurate, BENZENJI mercaptan, xylylene JIMERU captan, 4, and 4'-dimercapto diphenyl sulfide, well-known polyol, etc. are mentioned. When a diisocyanate compound and a JIISO thiocyanate compound are used as a monomer which has the structural unit of a general formula (A2) and/or (B-2), the poly thiol or polyol compound which carries out addition polymerization to these compounds is desirable. The amount of the poly thiol to be used or polyol is set up so that the total number of functional groups may become almost the same as the total number of functional groups of isocyanate or isothiocyanate.
[0048] The amount of the monomer and the monomer which can be copolymerized used which has the structural unit of these general formulas (A2) and/or a general formula (B-2) is set up so that the refractive index of the resin with which a weight ratio is 80% or less of a total presentation, and hardened the constituent may become 1.55 or more. As an initiator used light and/or in case heat curing is carried out, although a radical polymerization initiator well-known as a photopolymerization agent and a cationic initiator are used, for example, these constituents 2, 6-dimethylbenzoyl diphenyl phosphine oxide, 2 and 4, 6-trimethyl benzoyl diphenyl phosphine oxide, 2, 4, 6-trimethyl benzoyl phenyl phosphinic acid methyl ester, Acyl phosphine oxide and acyl phosphinate, such as 2, 6-dichloro benzoyl phenyl phosphine oxide, 2, and 6-JIMECHITOKISHI benzoyl diphenyl

phosphine oxide, 1-phenyl-2-hydroxy-isobutane-1-ON, 1-hydroxy cyclohexyl phenyl ketone, 4-JIFENOKISHI dichloro acetophenone, a diethoxy acetophenone, Acetophenone system compounds, such as 1-(4-isopropyl phenyl)-2-hydroxy-isobutane-1-ON, And a benzophenone, 4-phenylbenzo phenon, benzoylbenzoic acid MECHIRUCHI, 4-phenylbenzo phenon, hydroxy benzophenone, 3, and 3'-dimethyl-4-methoxybenzophenone, There are benzophenone system compounds, such as a JIFENOKISHI benzophenone, aromatic series diazonium salt, aromatic series sulfonium salt, aromatic series iodonium salt, a metallocene compound, etc.

[0049] Desirable photoinitiators are 2, 4, 6-trimethyl benzoyl diphenyl phosphine oxide, and a benzophenone. A thing well-known also as a thermal polymerization initiator is used, benzoyl peroxide, diisopropyl peroxy carbonate, lauroyl peroxide, tert-butyl peroxide (2-ethylhexanoate), azobisisobutyronitril, etc. are mentioned, and they are benzoyl peroxide and tert-butyl peroxide (2-ethylhexanoate) preferably.

[0050] When using a diisocyanate compound and a JIISO thiocyanate compound with the structural unit of a general formula (A2) and/or (B-2), and the poly thiol and a polyol compound as a constituent, Lewis bases, such as dibutyltin dilaurate, metallic compounds like aluminum TORIISO propoxide, tertiary amine, and the 3rd class phosphine, can be used as a catalyst of an urethane(thio)-ized reaction.

[0051] These initiators may use photo-curing and heat curing together the using two or more sorts together, and making it complete hardening whether you are Sumiya purpose. the rate of light and/or a thermal polymerization initiator -- a monomer or a constituent -- receiving -- 0.01 - 1 weight section extent -- it is 0.02 to 0.5 weight preferably. If there is too much blending ratio of coal of an initiator, the internal homogeneity of hardening resin is not only inferior, but a hue will get worse. When there is too little blending ratio of coal, it becomes impossible moreover, to fully stiffen a monomer or a constituent.

[0052] Moreover, in this invention, a hardening accelerator, a photosensitizer, an antioxidant, an ultraviolet ray absorbent, a coloring agent, a bulking agent, etc. can also be added and hardened if needed to the constituent before hardening. A well-known photopolymerization initiator and/or a well-known thermal polymerization initiator, and after a photosensitizer and a hardening accelerator are added further if needed, a monomer or a monomer constituent can close a light emitting diode component, and can obtain this invention light emitting diode.

[0053] If the approach of the closure is shown, as shown, for example in Fig. 1, this invention light emitting diode 1 can trickle a monomer or a monomer constituent, and can be made hemispherical so that a light-emitting part 4 may be laid underground on the substrate 3 of the light emitting diode component 2, and this invention light emitting diode 1 as shows this to drawing 3 as transparence resin 5 by carrying out polymerization hardening can be obtained. Moreover, as shown in Fig. 2, it can fix so that the light-emitting part 4 of the light emitting diode component 2 may be located in the center section in the mold cavity 7 for the size enlargement of the transparent metal mold 6, and the light emitting diode closed also by pouring in a monomer or a monomer constituent and carrying out polymerization hardening can be obtained.

[0054] As for hardening by the polymerization, it is desirable that a monomer and a

constituent are liquefied at a room temperature and the temperature of 80 degrees C or less in consideration of workability. If the mold in which the closure point had desired curvature is used although there is especially no limit about the configuration of a mold when using a die, a component can be cast as a lens with the closure. In case photo-curing is performed, ultraviolet, visible, and the activity energy line of an infrared region are used according to the property wavelength of a monomer and a constituent, a photopolymerization initiator, or a sensitizer, and are performed. In case heat curing is performed, it hardens at the temperature of the field doubled with the property of a monomer and a constituent, and a thermal polymerization initiator and a curing agent. In order to make it complete hardening whether you are Sumiya, these photo-curing and heat curing may be used together.

[0055] Although especially the light source or the heat source of an optical exposure at the time of performing light and/or heat curing are not limited, in performing photo-curing, when performing heat curing according to the property wavelength of a monomer or a photopolymerization initiator, according to the property of a monomer or a thermal polymerization initiator, it is chosen suitably. Although parallel light and the scattered light are irradiated using the ultraviolet-rays light sources, such as a high pressure mercury vapor lamp, a metal halide lamp, and a short arc lamp, and hardening is generally made when performing photo-curing, use of visible [, such as laser,] and the source of infrared light is also possible at concomitant use of a photosensitizer. The resin seals LED and LD obtained by this invention may process annealing by hardening afterbaking etc. in order to reduce the stress distortion inside resin, and an optical strain. Moreover, it is also possible to perform surface treatment, such as alternative ion and low-molecular diffusion, in a rebound ace court, an acid-resisting coat, dyeing, or the lens section.

[0056]

[Example] The following examples are for explaining this invention more concretely. In addition, the section in an example shows the weight section. Moreover, many properties of a hardened material given in an example were measured by the following examining method.

(1) Appearance : it is based on viewing.

(2) Refractive index Nd : Abbe refractometer (product made from ATAGO)

(3) Total luminous flux : 20mA constant current was impressed to LED, and the total luminous flux (unit: lm= lumen) emitted from an LED lamp was measured using the integrating sphere.

In addition, an LED chip given in an example is a periodic table. The thing of the double hetero structure which consists of Ga, aluminum, and As which are an III-V group was used. A refractive index is 3.52 and is red light emitting diode whose luminescent color is 650nm.

[0057] [Example 1] Churning mixing of the 2, 4, and 6-trimethyl benzoyl diphenyl phosphine oxide 0.1 section was carried out as a photopolymerization initiator at homogeneity, and it poured into the casting mold shown at drawing 2 at the p-screw (beta-methacryloiloxy-ethyl thio) xylylene 100 section. From the casting draw spike section, the LED chip with a terminal was fixed so that the light-

emitting part of each LED chip might be located in a constituent center section. In the distance of 40cm, the metal halide of output 80 W/cm which exists up and down performed UV irradiation in this whole mold for 3 minutes, and it was stiffened. The resin seal LED lamp which unmolds, cuts off one side of a terminal and is shown in drawing 3 was obtained. The total luminous flux of the obtained lamp was 0.20lm. On the other hand, it poured in the mold of optical polish glass using the silicon plate with a thickness of 2mm as a spacer, and it hardened like the above, the constituent was unmolded, and the test piece for refractometry was produced. The refractive index of the obtained hardened material was 1.60.

[0058] [Example 2] Instead of the p-screw (beta-methacryloiloxy-ethyl thio) xylylene 100 section, the 4 and 4'-screw (2-methacryloiloxy-ethyl thio) diphenylsulfone 100 section was used, and the LED lamp and the test piece for refractometry were obtained like the example 1. The total luminous flux of the obtained lamp was 0.25lm(s), and the refractive index of the obtained hardened material was 1.65.

[0059] [Example of a comparison] Instead of the p-screw (beta-methacryloiloxy-ethyl thio) xylylene 100 section, the tetraethylene glycol dimethacrylate 100 section was used and the LED lamp and the test piece for refractometry were obtained like the example 1. The total luminous flux of the obtained lamp was 0.95lm(s), and the refractive index of the obtained hardened material was 1.48.

Drawing 5 takes and plots the total luminous flux to which it is made an axis of abscissa from the refractive index of closure resin, and it makes outgoing radiation of examples 1 and 2 and the example of a comparison to an axis of ordinate from an LED lamp. By forming closure resin into a high refractive index shows that-izing of the LED lamp can be carried out [high brightness].

[Translation done.]